



# ***PATHFINDER***

An informal newsletter for the GPS user community by PM GPS of Project Manager Navigation Systems. Information presented is based on published and submitted news items of interest to the general user. Widest dissemination and reproduction is encouraged. Newsworthy items are solicited for inclusion. Editor Mr. Don Mulligan at PM GPS, PM NAV SYS, Ft Monmouth NJ DSN 992-6137 or (732) 532-6137 or email: [Donald.Mulligan@iew.s.monmouth.army.mil](mailto:Donald.Mulligan@iew.s.monmouth.army.mil)

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## ***PM's Corner: PLGR is the Only DoD Authorized Handheld Receiver Approved for Combat Ops!***



The main article in this issue addresses "the rest of the story" with regard to the use of GPS in Operation Iraqi Freedom.

Some folks took issue with PLGR, the official military handheld GPS receiver. Some media reports said commercial GPS receivers worked just as well or even better than PLGR, raising the question "why does DoD policy still require the use of PPS-rated GPS receivers like the PLGR?"

The policy is there for a good reason. The media may not fully understand potential electronic warfare threats on the battlefield but you do. This issue will provide replies to some of the most frequently heard comments.

I won't argue that when compared to the user-friendly designs of the latest commercial GPS receivers, the PLGR with its lack of graphic display looks a little dated. That can't be helped since the PLGR was designed 10 years ago. Technology changed a lot in that period of time.

The Army is moving beyond PLGR with a new generation of PPS-rated handheld GPS receiver called the DAGR.

Our work on the DAGR program (and the closely related embedded GPS program called GB-GRAM) will pay big dividends in the near future. As a military user you need to understand that the military-only features NOT found in a slick new commercial GPS receiver may be critical to your survival on tomorrow's battlefield.

Using a commercial receiver or a PPS-rated receiver like PLGR without the proper COMSEC crypto-key could place you in harms way. Please take the time to read this issue carefully. If you have further questions, contact me or my staff.

***Skip Harborth,***

***LTC, US Army***

***Product Manager, GPS***

## ***Use the Right Software for PLGR!***

The Army recently completed extensive testing to verify that the latest versions of PLGR Operating Software are fully compatible with the many weapons systems that rely on PLGR for Position, Velocity and Timing (PVT) data. Army PLGR should now be using either software version 613-9854-005 (standard PLGR) or 613-9868-008 (enhanced PLGR). These are the same versions previously recommended for Air

Force, Navy and Marine users.

The new software is available as MWO 11-5825-291-30-4. Contact your MWO coordinator or get it direct via the RDIT website. More information including the availability of reprogramming kits is provided elsewhere in this issue.

*Ed McAuley at DSN 992-6136*

## *PLGR in IRAQ (The Rest of the Story)*

Since the end of major combat operations in Iraq, the GPS office has collected media reports and field user comments about the use of GPS. We'd like to share some of this feedback:

The AN/PSN-11 PLGR (standard or enhanced version), is the only military-rated hand-held GPS receiver authorized for combat and combat support. This reflects DoD policy mandating the use of Precise-Positioning Service (PPS) devices for combat and combat support operations.

The rationale behind PPS-rated receivers is that they provide signal accuracy and protection measures that are not available to commercial GPS receivers. These features are accessed through the use of COMSEC crypto-variable keys to 'read' encrypted parts of the GPS signal. Using commercial GPS on the battlefield is about as secure as using a bullhorn to call out your position.

We will address some of the frequently heard comments and provide a reply to each:

Start with this Baseline: PLGR is a proven performer even if it is no longer on the cutting edge of design. "People in the Know" use PLGR. For example, Special Operations Forces (SOF) installed them to Desert Mobility Vehicles (at right) and connected the PLGR to other installed systems. This provided PPS quality position and timing data for critical communications including 'call for fire' when SOF absolutely wanted an accurate and reliable position location. With power from the host vehicle, there was no battery problem. The remote antenna and cable allowed uninterrupted use of PLGR if the crew had to 'button up' inside the vehicle. Like some other units, SOF used cheap commercial handhelds for checking personal locations but they relied on PLGR when they needed a location position for a critical task.

*"Commercial GPS receivers are smaller and lighter than PLGR"*

Reply: True but PLGR and commercial GPS receivers were about the same size when PLGR was introduced back in 1994. Since that time, technological evolution has introduced new GPS receivers that pack more features into a smaller product. Just as cell phones have become smaller, the newest

GPS receivers are smaller than their predecessors. Before PLGR the Army man-portable GPS receiver was a 17 lb backpack! Military procurement takes a lot longer than civilian product introduction but we are happy to say that DAGR, the Army's new second-generation handheld receiver is nearing production. DAGR is about the same size as today's most popular civilian GPS receivers.

*"Commercial receivers take fewer batteries to operate".*

Also true. The continuing technological improvements that reduced the size of GPS receivers has also reduced their power consumption so its no surprise that the newest models use less power. Good news is that DAGR, the new Army receiver will operate on standard AA batteries and draw less power! Bad news is its just not feasible to rebuild PLGR to use less power.

*"Commercial GPS receivers perform better".*

Maybe. With the latest technology a commercial receivers can track more satellites than PLGR. The more satellites you track, the better your performance—all other things being equal. When PLGR was introduced it was state-of-the-art and it tracks multiple satellites. Today's products track more satellites using "All-in-View" technology. DAGR will include this technology. But don't

compare performance of a PLGR without crypto-key to a commercial set! A PLGR without a COMSEC key is no better than an old commercial GPS receiver since it cuts out the PPS-based anti-jam and anti-spoof protections provided through the COMSEC key!

Also, as the media reported, Allied Forces destroyed GPS jammers set up by Iraqi defense forces (using COMSEC protected GPS guided missiles by the way). If the jammers had not been taken out, those nifty commercial GPS receivers may have performed a lot worse since they are not designed to counter any adverse EW conditions. Are you sure it's a good idea to rely on a set that doesn't know if its being spoofed or jammed? We recommend you stick with PLGR and DAGR.



Special Ops Forces Desert Mobility Vehicles equipped with PLGR, "The Real Thing" on patrol in Iraq

## The Rest of the Story (Cont'd)

*"Commercial GPS receivers are easier to operate and use maps".*

Reply: True enough. This reflects advances in user-friendly software and graphics-capable displays. It is not affordable to retrofit these features to PLGR but they will be included in the DAGR.

*"Battery use was a problem".*

Reply: Power consumption is always an issue for handheld GPS receivers. If you operate PLGR in Continuous Mode, you'll drain the BA-5800 quickly and it takes three sets of AA batteries to equal the performance of one BA-5800! We can't rebuild PLGR to use the latest power-consumption technology but its replacement, the DAGR will use AA batteries to produce the same level of performance provided by a BA-5800 for PLGR today.

*"Do we have to use the BA-5800 for our PLGR?"*

No. You have portable power options. Although the BA-5800 battery is the best power source, it is heavy, potentially dangerous and sometimes hard to get. NSN 6135-01-440-7774 comes in a pack of eight and costs about \$20 per battery. Other options include 8 each AA batteries (alkaline, lithium L-91 or rechargeable—all available through DLA supply), used with the AA battery tray, NSN 6160-01-385-4358 which costs about \$12.50.

There is still another option: A unique rechargeable Ni-Cad battery that maintains its charge while installed to a PLGR connected to external power. NSN 6140-01-400-2902 costs about \$80. If the PLGR is connected to external power, vehicle power will keep this special PLGR battery fully-charged so you can periodically remove PLGR for dismounted operations and then return it to the mount to recharge while you drive on. This option should give you long battery life in combined handheld - vehicle mounted operations. You can also recharge this special battery outside the PLGR with a charging stand that you must order directly from Rockwell-Collins at (800) 321-2223. They have stands for one, three and six batteries that will cost you from \$200 to \$600.

The PLGR recharging feature is limited to this model battery only. PLGR can't recharge any other model of rechargeable battery. And remember the BA-5800 is not a rechargeable battery and should never be left in PLGR when you connect PLGR to external power!

*"Can we connect PLGR to external power?"*

Reply: You sure can. A number of vehicle and weapons platform managers have developed "installation kits" using the external power cable and remote antenna/cable sets available through standard supply. Installation guidance is available from the specific platform managers. Be careful about where you connect to vehicle power and how you ground the connection! PM GPS staff can provide assistance or point you in the right direction. Our experience with PLGR has benefited the DAGR program so you can expect DAGR to offer flexible options for installing to host platforms and connecting for external power.

*"Can we get recharging cables and external antenna for our commercial GPS receivers?"*

Reply: No, the special rechargeable battery described above only works with PLGR. If you bought commercial GPS we can't help you with cables or external antennas.

The same advice holds if you bought Etrex, Rhino or any other brand of commercial grade GPS. These personal GPS devices feature the latest technology for civilian use but are not authorized for combat or combat support use. DoD policy prohibits us from spending funds on unauthorized equipment so we cannot help you with those items.

*"But we can get external antenna for PLGR?"*

Sure, that's been a popular accessory for years. The PLGR remote antenna has a magnetic mounting base and is used with the remote antenna cable. We cannot vouch for the use of PLGR accessories with any commercial GPS receivers because none have been tested for that purpose.

*"So where is the Army headed?"*

Reply: Commercial products looked good but remember it was a relatively "quiet" EW environment and no one can guarantee the next battlefield will be quickly "sanitized". GPS jammers can be added or replaced at low cost and the Army anticipates hostile EW in the future. That threat is being addressed by programs developing next generation GPS security devices. You will find the DAGR to be a robust replacement for PLGR that provides battlefield reliability with today's best technology. In the meantime, stick with PLGR for position location accuracy. Your life could depend upon it.

## *CUGR Finds A New Home with OH-58A+*

National Guard units operating the OH-58A+ helicopter are now receiving the Cargo Utility GPS Receiver (CUGR) Aircraft Navigation Set originally procured for the UH-1H/V fleet. The reduction in the operating UH-1 fleet made enough CUGR available to share

the system with OH-58 aircraft. Although it is not integrated to flight instruments like the UH-1 design, the CUGR provides the OH-58 crew with advanced standalone GPS-based navigation system.

*Don Mulligan, DSN 992-6137.*

## *PLGR Reprogramming Maintenance Work Order*

In February 2003, the CECOM MWO Office released MWO 11-5825-291-30-4, TCTO 31R4-2PSN11-507 to update PLGR software. Initially, the MWO advised Army users to update Baseline II PLGRs to software version 613-9854-005 and Baseline III and above PLGRs to software version 613-90544-101.

As noted on the cover of this issue, the MWO guidance for PLGR software has revised:

Army users should update Baseline II PLGR (tan) to software version 613-9854-005 and Baseline III and above PLGR (green) to software version 613-9868-008. The newly recommended software is included in the February 03 MWO, just select the proper version. The Materiel Change Number (MCN) is 1-03-07-0013.

Previously, the Army restricted the use of "-008" PLGR+96 software to approved users of the Leica Vector VIPER rangefinder. The Army tested this software to confirm that it did not present a problem to the weapons systems that use PLGR. The Army now joins the Air Force, Navy, and USMC users in making PLGR+96 the **preferred software** if the

hardware will support it. The Technical Manual supplemental addressing PLGR+96 features will soon be available from the Army Publishing Directorate.

Army users who desire a paper copy of the PLGR+96 TM supplement should contact the Georgia Field Office (GFO), download it from the CECOM RDIT site or contact your installation MWO coordinator.

The MWO/TCTO is available at the CECOM RDIT website <http://rdit.army.mil/rditindex.html>. CD ROM's containing the software have been distributed to each post, camp, or station MWO Coordinators or Direct Support (DS) units. Those same agencies should have the previously issued PLGR reprogramming kit which contains the cable needed to install the software. Reprogramming kit # is 5825K3118004ANS. The TCTO kit number is 5825K3118012ANS.

*Software: Frank Rowe at DSN 468-9511.*

*Reprogramming: Ed McAuley at DSN 992-6136.*

## *Laser Range Finders and GPS*

Several years ago, the US Army embarked upon a program to introduce laser rangefinder technology to identify targets for engagement by fire support systems. The initial system, a Leica "Vector IV" binocular laser rangefinder, utilized an Enhanced PLGR with special software (PLGR+96) to compute and display a target location based upon the observer's present position along with range, azimuth and vertical angle provided by the laser rangefinder. These systems are commonly called VIPER. They can be outfitted with Army standard night vision devices when needed.

Today, several laser rangefinder systems are in use: The Vector IV has been complemented with the Vector 21, which has greater range. The Northrup Grumman "Mark VII" system is a monocular device, with an integral night vision capability that does not

require PLGR+96 software. DRS Technologies also has a monocular system, the LH-41C, with provisions for a top-mounted night vision scope. All of these systems require compass compensation after changing location.

The listed systems have been safety tested in a field environment with the PLGR and found to be safe for use. Caution should be exercised when using any of these devices with other GPS receivers as the software might not be safe to use under all conditions and/or modes.

The range accuracy of these devices greatly increases the lethality of any engagement system and gives the warfighter an edge on the battlefield.

*Bill Pohlmann at DSN 992-6131*

## ***Rechargeable Batteries —Requesting your input***

The next generation military handheld GPS receiver (Defense Advanced GPS Receiver – DAGR) will operate on standard AA batteries. This feature will facilitate the use of readily available rechargeable batteries in support of the Army initiative to use rechargeable batteries for non-combat operations.

PM GPS is currently studying the use of AA rechargeable batteries as we prepare to begin fielding DAGR in 2004. We invite input from anyone who has used commercial AA chargers or any of the currently available rechargeable AA batteries (Alkaline, Nickel Cadmium and Nickel-Metal Hydride). Please share your comments with PM GPS, SFAE-IEW&S-NS GPS Bldg 563 Fort Monmouth, NJ 07703 or email

franklin.f.lee@us.army.mil

*Franklin Lee DSN 992-6303*

## ***Update to PLGR Soldiers Guide***

The Joint Service Support Management Office (JSSMO) at Warner Robins AFB Georgia is currently updating the PLGR Soldiers Guide to reflect some important changes since the guidebook was first published in 1996. Army PM GPS Georgia Field Office is coordinating the Joint Service effort to provide accurate informa-

tion about software, PLGR installation guidance and consumable-expendable items. When the new version is available (target date for new publication is Sep 2003), you'll be able to requisition it through standard military publication channels. To submit a comment on the PLGR Soldiers Guide or to get the latest status on the effort you can contact the Georgia Field Office.

*Willie Jackson at Georgia DSN 468-3518*

## ***Big News— Small Product***

On behalf of the GPS Joint Program Office, The Army at Fort Monmouth has awarded the first production contract for the Ground-Based GPS Receiver Applications Module (GB-GRAM). What is it? The GB GRAM is the future of GPS for most of the Army! It provides a complete PPS-rated state-of-the-art GPS receiver in a small package for insertion to a wide range of soldier portable, weapon and vehicle mounted weapon systems. The GB GRAM is about the size of a thin pack of cigarettes. Eventually, GB GRAM will replace the use of handheld GPS receivers like PLGR which are connected to other devices with cables. Using GB GRAM to embed the GPS receiver inside radios, navigation or weapon systems will eliminate a piece of gear and make GPS data transparent to the user since the host device will automatically start and monitor the GPS receiver. The first GB GRAM are already being tested by leading weapons systems with the first production units scheduled for integration and fielding starting in 2QFY04.

*1LT Daniel Vore at DSN 833-5885*

## ***How To Contact PM GPS***

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### *Who to Call?*

For the Space and Control Segments, GPS integration and new products, call California.

For sustainment support including software, supply, technical publications and accessories, call Georgia.

For equipment authorizations, Deferred Maintenance, fielding, host vehicle installations and New Equipment Training, call New Jersey.

WEBSITE: <http://Army-gps.robins.af.mil>



## ***The Evolution of Hand-held Military-rated GPS Receivers Equipped to Operate in Precise Positioning Service (PPS) Mode***

In 1988 the first “backpack” PSN-8 sets were fielded. In 1990/1991 “Commercial Off The Shelf” lightweight GPS receivers were purchased for Operation Desert Storm. In 1994 the AN/PSN-11 PLGR was introduced and in 2004 the AN/PSN-XX Defense Advanced GPS Receiver (DAGR) will be introduced.



From the left, the 17lb PSN-8 backpack @ \$34,000, the 10lb PSN-9 portable @ \$20,000, the 4 lb PSN-10 @ \$3,800, the 3 lb PSN-11 PLGR @ \$1,058 and coming next year, the DAGR: It will weigh under 2lb with a total size less than 38 cubic inches, price TBD.

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